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A NATIONAL WATER QUALITY BASIC DATA PROGRAM

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A NATIONAL WATER QUALITY BASIC DATA PROGRAM [1]

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Planning for the best use of our water resources clearly requires continuing intelligence on trends in water quality. Data reflecting such trends are not available in continuity for our water resources generally. The files of local, State, and Federal agencies contain much information covering short periods or specific situations, but a broad national picture of the physical, chemical, and biological trends is not available. Even where long-range surveillance programs are in operation it is not possible to project data nationally because analytical techniques are not uniform, coverage differs with locale, and the analyses do not adequately depict the effects produced by the newer pollutants. Existing state-wide or basin-wide programs in the field are mostly of recent origin and only limited data are available.

The inadequacy of water quality data has been widely recognized. The Presidential Advisory Committee on Water Resources Policy in its report

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of December 22, 1955, (H .D. No. 315, 84th Congress, 2nd Session) noted the deficiency in collection of data on chemical and biological water quality and recommended a marked increase in expenditures for this activity. In discussing the importance and need for such data in the planning of water resources developments the Committee stated that since the physical distribution of water is not governed by State boundaries there needs to be a primary program supported by the Federal Government. However, it emphasized that State and local participation is extremely important and should be continued and encouraged.

Specific responsibility for the development and conduct of a basic data program was placed in the Public Health Service under Section 4(c) of Public Law 660 (84th Congress), which states that "... the Surgeon General shall, in cooperation with other Federal, State, and local agencies having related responsibilities, collect and disseminate basic data on chemical, physical, and biological water quality insofar as such data or other information relate to water pollution and the prevention and control thereof."

PLANNING CONSIDERATIONS

In the light of present and anticipated needs the Public Health Service is initiating a long-range basic data collection program and establishing a national network of sampling stations. The program is intended to be a permanent activity, oriented to supplying the knowledge now needed for discerning national trends in water quality. It has evolved from extensive discussions with local, State, inter-State,

and other Federal agencies. Active local participation is an important part of the operation and will assure development of the maximum amount of information of value locally and nationally. It is expected that the national network will be supplemented with intra-State nets operated by State and other agencies where these are not presently established.

Emerging problems in water supply and water pollution control require that new parameters be evaluated and utilized, such as the measurement of radioactivity and synthetic organic chemical loadings, and the use of aquatic life as sensitive biological indicators of pollution. However, both the old and new parameters must be used, since we must consider all legitimate water uses.

The cost of the program is being shared by the State or local agencies and the Federal Government whenever possible. Local laboratories are being invited to participate by performing the conventional analyses and collecting the samples for the newer analyses. The Public Health Service in turn is responsible for performing the newer examinations and making these results available immediately to the collaborating State and/or local agencies. In addition, there are available to the participating agencies the consultation, training, and other resources which can be provided by the Public Health Service. It is recognized that many laboratories are not now staffed and equipped to carry out the newer analytical techniques. As local resources develop, they can be used to supplement the base PHS network and to carry out the newer analyses.

The program will help to determine needs for new parameters for judging water quality. Development of new analytical techniques will be carried on concurrently as a part of the overall Public Health Service research program. T hese will be used as developed and needed in the Basic Data program.

OVER-ALL OBJECTIVES

The primary purpose of the program is, as indicated, to provide for continuous determination of the quality of the Nation's waters. It will establish base lines for measuring progress in water quality improvement and for detecting early deterioration of our water resources. The principal objectives of the program are, then, to provide:

a. Continuous information on the nature and extent of pollution affecting water quality.

b. Long-term information on changes in water quality as affected by changes in water use and development.

c. Data which will guide State, inter-State, and other agencies in their water pollution control programs.

d. Data on water quality useful in the development of comprehensive water resources programs.

e. Data useful in selection of sites for municipal and industrial water use, and for other legitimate purposes.

PLAN OF OPERATIONS

1. SAMPLING LOCATIONS

Sampling locations were selected to satisfy one or more of the following general categories:

a. Major waters used for public water supply, propagation of fish and wildlife, recreational purposes, and agricultural, industrial, and other legitimate uses.

b. Inter-State, coastal, and Great Lakes waters.

c. Waters on which activities of the Federal Government may have an impact.

Final locations of sampling points were fixed after discussions with State and local agencies invited to participate in the program.

2. LABORATORY ANALYSES

Criteria for judging water quality will depend upon the uses which will be made of the waters. Those for domestic purposes should be clear, colorless, taste-free, relatively low in mineral content, and relatively free of deleterious biological and chemical substances. Agricultural water is judged primarily on its mineral content. Water for fish propagation and recreational purposes must be relatively free from domestic and industrial pollution and must be capable of sustaining an active flora of the smaller aquatic organisms on which fish and other wildlife feed. Industrial water quality requirements run the gamut from complete demineralization for certain processes to cooling waters in which temperature is a critical factor. In this program we have endeavored to include those parameters significant to the various legitimate purposes for which the streams are used.

The analyses planned have been selected on the basis of emerging and forseeable problems in water quality management, as well as those presently existing. They will include:

a. Radioactivity

Interest is rapidly growing in routine monitoring of surface waters for radioactivity. With the development of nuclear power reactors and other peacetime atomic energy uses this interest will become even more intense. State and inter-State agencies, as well as municipalities are becoming increasingly concerned about establishing such programs. The Public Health Service has already initiated a reporting system for bringing results from local programs together for compilation and publication on a national basis. Experience with this basic data network will, it is hoped, encourage and stimulate still more effective State and local programs in radiation monitoring. Programs are already underway within the Service for monitoring the radioactivity of air and the milk supply. This phase of the water quality program will serve to further round out the environmental picture.

b. Synthetic Organic Materials

Wise foresight makes it imperative that background data on the presence of synthetic organics in our surface waters be obtained. This need is made more urgent by the increased use of insecticides, pesticides, fungicides, and other economic poisons, since much of this material reaches watercourses through land drainage. The vast increase in use of detergents in the past 10 years is common knowledge.

Many signs point to the continued rapid expansion of the chemical industries and to their extension to relatively new geographic areas. A doubling of the industry's production capacity by 1975 has been predicted. Expansion of the petro-chemical industry in the interior of the nation has also been predicted.

In some cases even trace concentrations of synthetic organics are sufficient to interfere with domestic water treatment and other legitimate water uses. The standard chemical determinations are not sensitive enough to detect these new pollutants, and very few laboratories are presently staffed and equipped to make this analysis. The CARBON FILTER TECHNIQUE, (encompassing the capture, recovery, and identification of organic substances) is the best tool available for collecting and identifying these materials and is being used in the national network. An added advantage in this analysis is the fact that the material recovered represents a tangible and relatively permanent record of the pollution and remains relatively stable for a long period after collection and isolation. Thus, a more detailed identification can be made later, should the need arise.

c. Biological Populations

Plankton frequently cause taste, odor and treatment difficulties in water supplies. Plankton productivity is directly related to the degree of organic enrichment from fertilizers, human wastes, and industrial wastes of sewage-like character. On the other hand, plankton are important as a food source for fish. Accordingly, a continuous record of plankton populations provides information of importance to water supply problems, to fish productivity, and to water pollution control in general.

Plans are being made for future sampling for bottom organisms and fish, as availability of funds may later permit. Current activities will include assembly of information on sport and commercial fishing, as such may be related to water pollution, from reports and publications of Federal agencies, State Water Pollution Control Agencies, and others on present and proposed programs in both clean and polluted waters.

d. Coliforms

The presence of coliform bacteria in surface waters is generally considered evidence of pollution from human or animal origin. Data on coliforms will help to point up the trends in the effectiveness of control of domestic waste discharges.

e. Conventional Significant Chemical and Physical Parameters

Conventional analyses to be provided by participating agencies will include biochemical oxygen demand (B.O.D.), dissolved oxygen (D.O.), chemical oxygen demand (C.O.D.), chlorine demand, pH, color, turbidity, temperature, ammonia nitrogen, chlorides, alkalinity (or acidity), and hardness. These will be determined routinely. Selected additional determinations will also be done routinely at locations where special problems exist. The roles of these determinations in evaluating water quality are well recognized.

f. Analytical Reference Service

In collecting analytical data from a variety of sources, measures are needed to assure their precision and accuracy. The Analytical Reference Service has been designed to meet this need and will be utilized by the State and local participating laboratories. It assists them in improving their analyses and data.

The laboratories are provided with synthetic standard samples whose qualitative makeup is given, but whose concentrations are unknown to the participants. The results are returned to our laboratory for comparison with the known quality and with the results of other participants. The results from all participants are then evaluated and reported. In the overall report, individual laboratories are identified by code numbers known only to the Public

Health Service. Thus, each laboratory can evaluate its own precision and accuracy on individual analytical procedures against the experience of other laboratories having similar responsibilities. A reliable means for evaluation of old and new analytical methods is also provided.

The Reference Service has met with enthusiastic response from about 40 Federal and State laboratories which have utilized it. Some 50 additional laboratories will be included as a part of the Basic Data Program.

3. SAMPLING AND LABORATORY SCHEDULE

The sampling and laboratory schedule in the Basic Data network will be as follows, for each sampling point:

Radioactivity of Water	Weekly
Radioactivity of Plankton	Monthly
Synthetic Organic Chemicals	Monthly
Plankton Populations	Monthly
Coliforms	Weekly
Conventional Physical-Chemical	Weekly

4. HANDLING AND DISTRIBUTION OF DATA

The data obtained in this program will be furnished to the participating agencies and to the States concerned on a routine basis as soon as available. Reporting forms for this purpose are now being prepared. All data will be entered currently on machine sorted punch cards for ready compilation. It is anticipated that results for a full

year will be ready for printing within one month following the close of the data year.

The Public Health Service plans to issue an annual compilation of all data in the network, as a Government publication available for general distribution. This compilation will have essentially three parts; (a) a section outlining the philosophy, objectives, and other aspects of the Water Quality Basic Data Program; (b) a section outlining the significance of the various analyses reported; and (c) a section containing the raw data from each station. The data on radioactivity in water, now being assembled from local laboratories not included in the Public Health Service network, may be included as a part of this Government publication.

SUMMARY

With increasing populations and the expansion of industry our pollution sources are growing. The present available information on water quality is inadequate to indicate long-term trends and to otherwise meet existing or anticipated needs in the development of our water resources.

The Public Health Service program for the collection of basic data on water quality will provide information on the chemical, physical biological, and radiological quality of the Nation's waters on a long-term basis. The network activity is being conducted cooperatively with State, local, and other agencies, and initially will include some 50 sampling stations on inter-State and Great Lakes waters.

The program is designed as a permanent but dynamic one. New analyses will be included as their need or usefulness is discerned, while others will be eliminated as circumstances indicate. It is hoped that the ultimate achievement will be an integrated Federal-State-local network. The information developed by such a network is essential to the soundest use of our natural water resources.